Always refer to *Making Tracks into Programming* for complete details of calculator operation.

**AOS™ ENTRY METHOD**

Lets you enter problems directly as they’re usually written, left to right. Calculator will execute operations in the following order: 1) single variable functions 2) powers/roots 3) multiplication/division 4) add/subtract. (Equals Key) completes all pending operations. This order of operations is also followed inside parentheses.

**CLEARING:**

Turning your calculator OFF and ON clears it completely.

- **CE** — clears last number entered (if not followed by an operation).
- **2nd CT** — clears the "t" register (memory 7) only.
- **CLR** — clears machine, except for memories and program steps.
- **INV 2nd CT** — clears the display, and all memories, but not program steps.

**POWERS AND ROOTS:**

To raise a number \( y \) to any power \( x \):
- Enter the number \( y \).
- Press \( y^x \).
- Enter the power \( x \).
- Press \( \equiv \) (or other function key).

To take the \( x \)th root of a number \( y \): \( x \sqrt{y} \)
- Enter the number \( y \).
- Press \( \text{INV} \ y^x \).
- Enter the root \( x \).
- Press \( \equiv \) (or other function key).

**MEMORIES:**

8 memories (numbered 0 through 7) are available for your use:

- **STO n** (n from 0 to 7) stores the number in the display in the memory you select (0 to 7).
- **RCL n** recalls the number from memory \( n \) into the display.
- **2nd EQU n** — swaps the display value with what’s in memory \( n \).
- **SUM n** — sums the number in the display into memory \( n \) (the result stays in the memory).
- **INV SUM n** — subtracts the number in the display from what’s in memory \( n \) (the result stays in memory).
- **2nd PRD n** — multiplies what’s in memory \( n \) by the number in the display (result stays in memory).
- **INV 2nd PRD n** — divides what’s in memory \( n \) by the number in the display (result stays in memory).

**FIX DECIMAL:**

To Set the Number of Decimal Places in the Display, press **2nd Fix n**, where \( n \) is the desired number of digits to the right of the decimal point (0 to 8).

Pressing **INV 2nd Fix** or **2nd Fix 9** removes the fix on the decimal point.

**ANGLE MODE:**

Your calculator is equipped to accept angle inputs, and to return angle calculation results, in 3 systems of units: Degrees, Radians, and Grads. When first turned on, the calculator is always in Degree mode.

- Press **2nd Rad** to change to Radian mode.
- Press **2nd Grad** to change to Grad mode.
- Press **2nd Deg** to change to Degree mode.

Be certain that your calculator is in the correct mode for the angular units you desire when performing any calculations involving angles, including:

- Trigonometric functions: \( \text{2nd Sin} \), \( \text{2nd Cos} \), \( \text{2nd Tan} \), and their inverses.
- Polar to Rectangular Conversion: \( \text{2nd P+R} \), and its inverse.
**CONVERSIONS:**

**Polar to Rectangular**
- Enter R, Press: $\text{z} \div$
- Enter $\Theta$
- Press 2nd $\text{P-} \rightarrow \text{y}$ is displayed.
- Press $\text{z} \div$ to read x.

**Rectangular to Polar**
- Enter x
- Press $\pi$ $\pi$
- Enter y
- Press INV 2nd $\pi$
- $\Theta$ is displayed.
- Press INV 2nd 6 to read R.

**Degrees, Min, sec to Decimal Degrees**
- Enter degrees, Press $\text{d}$
- Enter minutes (2 digits)
- and seconds (2 digits).
- Press 2nd D.MS for decimal value.

**Decimal Degrees to Degrees, Min, Sec**
- Enter decimal degrees.
- Press INV 2nd D.MS
- (Degrees, minutes, seconds) now displayed.

**STATISTICAL KEYS AND FUNCTIONS:**

Begin statistical calculations by turning calculator OFF and ON; or by pressing INV 2nd $\sqrt{x}$.

If you have only one set of data to analyze:
- Enter each data point.
- Press 2nd $\Sigma+$.
- Repeat for all points.
- Press 2nd $\sigma^2$ to calculate the mean.
- Press 2nd $\sigma^2$ $\sqrt{x}$ to calculate the variance (with N weighting).
- Press 2nd $\sigma^2$ $\sqrt{x}$ to calculate the standard deviation of the data (with N weighting).

If you have two sets of data to analyze simultaneously:
- Call the two sets of data "x" and "y" arrays.
- Enter an "x" data point.
- Press $\text{x} \div$
- Enter a "y" data point.
- Press 2nd $\Sigma+$
- Repeat for all points.
- Press INV 2nd $\bar{x}$ to calculate the mean of the "x" data points.
- Press 2nd $\bar{x}$ to calculate the mean of the "y" data points.
- Press INV 2nd $\sigma^2$ to calculate the variance of the "x" data points.
- Press 2nd $\sigma^2$ to calculate the variance of the "y" data points.

(Use $\sqrt{x}$ key to calculate standard deviation.)

**CALCULATOR KEY CODES IN NUMERICAL ORDER**

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Basic Programming Keys

LRN – “Learn” Key
- Pressing this key once, puts calculator in “learn” mode – ready to remember up to 50 program steps (numbered 00 to 49). Display switches to special format: 00 00.
- Pressing this key once again takes calculator out of learn mode, calculator retains program steps. (Display reverts to the standard format).

RST – Reset Key
Resets program pointer to first step (step 00); whether entered from the keyboard or encountered as part of a program. (Also, clears Subroutine Return register.)

R/S – Run/Stop Key
When out of learn mode, this is the start/stop key for your program. If the program is stopped, pressing R/S starts it; if it’s running, pressing R/S stops it. When R/S is inserted as part of a program (in learn mode) it will stop the program at that point.

2nd Pause
While a program is running, encountering a 2nd Pause instruction causes the program to halt and display contents of the display register for about ¾ of a second.

2nd label n – Label Key Sequence
Allows you to label up to 10 points in a program – n is from 0 to 9. (Labels cannot be used more than once within the same program.)

GTO n – Go to Label n Key Sequence
Causes program pointer to immediately go to label n (n from 0 to 9), whether encountered as part of a program, or used from the keyboard.

GTO 2nd nn – Go to Step Number nn Key Sequence (nn from 00 to 49) – May be used when out of learn mode only. Positions program pointer at step number nn.

Program Decision-Making

2nd ⇒ c – Decrement and Skip on Zero Key Sequence
Works together with memory zero. When 2nd ⇒ c is encountered in a program:
- First, the contents of memory zero are decreased by one (increased by one if the contents are negative).
- If the result is NOT ZERO, the calculator proceeds to the step following 2nd ⇒ c.
- If the result IS ZERO, the calculator SKIPS the step following 2nd ⇒ c, and continues.

INV 2nd ⇒ c – Decrement and Skip if not Zero Key Sequence
When encountered in a program:
- First, the contents of memory zero are decreased by one (increased if the contents are negative).
- If the result is NOT ZERO, the calculator SKIPS the step following INV 2nd ⇒ c and continues.
- If the result IS ZERO, the calculator proceeds to the step following INV 2nd ⇒ c.

⇒ t – x exchange with t Key
Swaps what’s in the display register with what’s in the “t” or “test” register. (The t register is memory 7.)

The Conditional Transfer Test Key Sequences – cause the calculator to compare the contents of display (or “x”) register with what’s in the test (or “t”) register, and ask one of the 4 questions below:

2nd ⇒ t – Is x equal to t?
If the answer is YES, program goes directly to step that follows key sequence.

2nd x≠t? Is x not equal to t? (x≠t?)
If the answer is NO, program SKIPS step that follows key sequence, and continues.
**Subroutines:**

**SBR** n and **INV SBR** Key Sequences

**To Create a Subroutine** – just begin any series of program steps you need to use repetitively with a label. End the series of steps with an **INV SBR** key sequence.

**To Use a Subroutine** – Insert an **SBR n** Key sequence in your program where n is the label number of the subroutine.

**Editing Keys:**

**SST** – Single Step Key

Steps through program steps one at a time. When used in “learn” mode, displays program key codes sequentially. When used out of “learn” mode, executes program one step at a time.

**BST** – Back Step Key

When used in “learn” mode, steps backwards through a program one step at a time.

**To Write Over a Program Step:**

Just get to the exact step number of a step you need to change, and (while in “learn” mode) key in the new instruction. It will replace the old one.

**2nd** **Nex** – No Operation Key

Can be used while in learn mode to blank out any program step with a null step.

**2nd** **Ins** – Insert Key Sequence

To insert program steps, just get to the location at which you’d like to add steps and press **2nd** **Ins** (while in “learn” mode). That instruction, and all that follow it, will be moved down one step.

**2nd** **Del** – Delete Key Sequence

To delete program steps, just get to the location of any step you’d like to delete, and (while in “learn” mode) press **2nd** **Del**. The instruction at that location will be deleted, and all those after it will be “brought up” one location to fill the gap it leaves.

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**Calculator Key Program Codes**

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<th>Rows</th>
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<th>Code</th>
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**Columns**

1  2  3  4  5
(for second functions)

6  7  8  9  0

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**Display in “Learn” Mode**

46  -39  6

*Program Location*  *Inverse Operation*  *Address or Label*